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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/079,775	02/19/2002	Marina V. Plat	D900D/1368D	9123

7590 05/27/2005
Kelly K. Korzik
Winstead, Sechrest & Minick P.C.
P.O. Box 50784
Dallas, TX 75201

EXAMINER

LEE, HSIEN MING

ART UNIT PAPER NUMBER

2823

DATE MAILED: 05/27/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/079,775

Applicant(s)

PLAT ET AL.

Examiner

Hsien-ming Lee

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 March 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 and 13-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 13-18 is/are allowed.
- 6) ☒ Claim(s) 1-3 is/are rejected.
- 7) ☒ Claim(s) 4-6 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

HSIEN-MING LEE
PRIMARY EXAMINER

5/5/05

Attachment(s)

- ☐ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: _____

DETAILED ACTION

Response to the Appeals Arguments

1. In view of the Appeal filed on 3/21/2005, PROSECUTION IS HEREBY REOPENED, as set forth below.

To avoid abandonment of the application, appellant must exercise one of the following two options:

(1) file a reply under 37 CFR 1.111 (if this Office action is non-final) or a reply under 37 CFR 1.113 (if this Office action is final); or,

(2) request reinstatement of the appeal.

If reinstatement of the appeal is requested, such request must be accompanied by a supplemental appeal brief, but no new amendments, affidavits (37 CFR 1.130, 1.131 or 1.132) or other evidence are permitted. See 37 CFR 1.193(b)(2).

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chung et al. (US 6,184,142).

In re claims 1-2, Chung et al., in Figs. 6A-6F and corresponding text, teach the claimed method providing a semiconductor device, the semiconductor including a first layer 113/116/112 desired to be etched, the method comprising the steps of:

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- (a) providing by depositing an antireflective coating (ARC) layer 114 (Fig. 6A) on the first layer 113/116/112, wherein the ARC layer is a SiON having antireflective properties (col. 4, lines 30-32);
- (b) patterning a first resist layer 130, the first resist layer 130 including a pattern having a singular aperture therein for etching a first portion (i.e. the portion where a dual damascene opening to be formed) of the first layer 113/116/112 (Fig. 6A);
- (c) etching the first portion of the first layer 113/116/112 to form a via (Figs. 6C);
- (d) removing the first resist layer 130 utilizing a plasma etch with O₂ plasma (Figs. 6A-6B), the ARC layer 114 being resistant to the plasma etch since Chung et al. teach that the ARC layer 114 is an **etch barrier** (col. 4, line 24) when the first photoresist layer 130 is subjected to O₂ plasma etch (col. 3, lines 66-67);
- (e) patterning a second resist layer 131, the resist layer 131 including a pattern having a plurality of apertures therein for etching a second portion of the first layer 113/116/112 (Fig. 6D); and
- (f) etching the second portion of the first layer 113/116/112 to form a trench as shown in Fig. 6F (Figs. 6E-6F).

In contrast, although Chung et al. do not teach that the first resist layer 130 has a plurality of apertures, mere duplication of apertures has no patentable significance unless a new and unexpected result is produced. See M.P.E.P. 2144.04, VI., B.

Therefore, it would have been obvious to one of the ordinary skill in the art, at the time of the invention was made, to apply the method of Chung et al. to a situation where it needs the plurality of apertures in the resist pattern without departing from the spirit of Chung's teachings

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(col. 5, lines 1-4), since by this manner it would provide a ground for the subsequent processing steps in forming plural interconnect plugs.

As far as the thickness of the ARC layer is concerned, Chung et al. further teach that the ARC layer has a thickness of between about **500** to 1,000 Angstroms (col. 3, lines 46-52). The thickness range "between about 500 to 1,000 Angstroms" allows for thickness slightly less than 500 Angstroms, which obviously teaches the use of a thickness within claimed range "less than about 500 Angstroms." See M.P.E.P. 2144.05 Obviousness of Ranges

In re claim 3, Chung et al. also teach using an oxygen plasma (col. 4, line 47) including a forming gas (i.e. oxygen-containing gas), the ARC layer being resistant to the plasma etch because Chung et al. teach that the ARC layer 114 is an **etch barrier (col. 4, line 24)**, i.e. resistant to O₂ plasma etch, when the first photoresist layer 130 is subjected to O₂ plasma etch (col. 3, lines 66-67);

Allowable Subject Matter

4. Claims 13-18 are allowed.
5. Claims 4-6 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.
6. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record neither teaches nor suggests that the plasma includes four percent of the forming gas; the ARC layer is three hundred Angstroms plus or minus no more than

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approximately ten percent; removing the SiON layer; and removing the first resist layer after the first portion of the first layer is etched.

Response to Arguments

7. Applicant's arguments filed 3/21/2005 have been fully considered but they are not persuasive.

Appellant argued that the anti-reflective coating (ARC) layer 114 in Chung et al. is not resistant to the plasma etch. See first paragraph, page 7, of the arguments.

Contrary to the argument, Chung et al. teach removing the resist layer 130 utilizing a plasma etch (col. 3, lines 66-67). The ARC layer 114, which is formed right under the resist layer 130 (Fig.6A), is an **etch barrier** (col. 4, line 24). The ARC layer 114 is thus exposed to the plasma etching gas while the resist layer 130 is removed using O₂ plasma (col. 3, lines 66-67). Since Chung et al. disclosed that the ARC layer 114 is an **etch barrier** (col. 4, line 24), one of the ordinary skill in the art would have recognized that the ARC layer 114 is resistant to the O₂ plasma.

Appellant further asserted that examiner's conclusion of obviousness is based on hindsight. See last paragraph, page 5, of the arguments.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the

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applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hsien-ming Lee whose telephone number is 571-272-1863. The examiner can normally be reached on Tuesday-Thursday (8:00 ~ 6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Hsien-ming Lee
Primary Examiner
Art Unit 2823

May 26, 2005

HSIEN-MING LEE
PRIMARY EXAMINER

5/26/2005